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PUBLIC HEALTH REPORTS.

UNITED STATES.

The report of the French yellow fever commission operating at Rio de Janeiro, Brazil.

[Abstract from report of the commission, as published in the "Annales de l'institut Pasteur," November, 1903.]

In 1901 a commission, composed of Messrs. Marchoux, Salimbeni, and Simond, of the Pasteur Institute, was appointed to conduct investigations in regard to the etiology of yellow fever and of the mosquito (*Stegomyia fasciata*) in the transmission of the disease at Rio de Janeiro. This commission rendered a report, which was published in the annals of the Pasteur Institute in November, 1903. The report has been translated in the Bureau of the Public Health and Marine-Hospital Service, and from this translation the following abstract of salient features has been made:

The Commission concludes that the infecting principle in the blood of yellow-fever convalescent remains active for five days when kept in defibrinated blood under liquid vaseline, but that at the end of eight days the infectivity of the blood has disappeared. They deduce as a result of their experiments that the blood contains this infecting agent during only the first three days of the disease.

They deduce further from their experiments that the blood serum of a yellow-fever convalescent possesses clearly preventive properties. They further deduce as the result of experiments upon 11 individuals made in hospital that the blood serum of a yellow-fever convalescent possesses therapeutic properties of considerable curative value.

In regard to the mosquito *Stegomyia fasciata*, their work is particularly valuable. They point out that the habits of the *Stegomyia fasciata* differ very much from those of most other mosquitoes. One of the marked peculiarities of the species is its extreme susceptibility to differences of temperature. It manifests its greatest activity when the thermometer stands at 25° C. Beyond 39° C. the insect dies. At 15° C. to 16° C. the insect becomes inert and ceases to bite. At 12° to 14° it is benumbed and flies with great difficulty. All of the acts of its life are much influenced by the temperature of the surrounding atmosphere.

The female *Stegomyia* alone bites. The female is perfectly capable of biting immediately after metamorphosis. Within twenty-four hours she bites readily. Within forty-eight hours of metamorphosis, and at temperatures between 26° and 35° C., she will bite readily at any hour of the day if recently fecundated, but especially beginning

at about 11 o'clock in the morning. If the temperature is between 19° and 25° she bites less readily. At temperatures between 14° and 18° she does not seek to bite at all unless artificially warmed by contact with the skin of the victim. She bites less readily between 22° and 25° , but a temperature of 27° to 30° is that which suits the insect best.

Laying.—After having filled herself with blood, the female seeks water upon which to lay her eggs. Laying is generally effected during the night. The average number of eggs is from 70 to 80. Temperature has an influence upon this act, it taking place most readily at a temperature of 27° to 28° during the night, under which conditions of temperature laying takes place within forty-eight hours after biting. If the night temperature is from 25° to 27° the laying takes place on the fourth or fifth day; if between 20° and 25° it is possible up to the seventh or eighth day, and if below 20° it may be delayed up to 26 or 27 days.

Hatching.—Hatching is best accomplished at a temperature of 28° , at which temperature the eggs hatch on the second or third day. If the temperature is as low as 25° , it takes place on the fourth day. If between 20° to 25° , hatching takes place on the fifth to seventh day, but does not proceed with regularity. The eggs do not seem to hatch at a temperature below 20° , though they may be preserved at much lower temperatures, even as low as zero, but if brought back to favorable conditions of temperature, hatching proceeds with considerable regularity. The eggs may be immersed in water and a considerable proportion of them still hatching. If dried before immersion their preservation is better assured.

Habits.—The *Stegomyia* is a domestic mosquito preferring for laying her eggs deposits of water such as are found in the interior and in the immediate neighborhood of houses. It seems to thrive better in rain than in spring water.

Pupal stage.—With temperatures ranging from 26° to 27° by night and 28° to 31° by day, the larvæ of the *Stegomyia* arrive at the pupal stage seven days after hatching, and at the perfect insect stage on the ninth day. In a majority of instances, however, this latter stage does not occur until the tenth day. At temperatures below 22° larvæ may take 40 to 60 days to be transformed into pupæ, and these pupæ 3 to 5 days to become perfect insects. The ordinary length of the pupal stage is 30 to 50 hours. Larvæ do not perish at a temperature in the neighborhood of zero, but under these conditions they grow very slowly.

Sea water is fatal to the larvæ of the *Stegomyia*, but in a mixture containing one-fifth sea water and four-fifths fresh water, they develop, attaining the pupal stage on the eleventh day and the perfect insect stage on the thirteenth day. In brackish water containing one-third sea water they die in a few hours. Water containing one one-thousandth of its weight of soap kills the larvæ in five minutes. In solutions containing one ten-thousandth they do not develop. In solutions containing one two-hundred-thousandth they developed normally.

Adult conditions.—Blood seems to be necessary to enable the female *Stegomyia* to lay. Human blood appears to be particularly grateful to them. Except in the early days of their existence, when she bites at any time, the female *Stegomyia* prefers to bite by night rather than by day. She may, therefore, be considered as a night mosquito.

Longevity of Stegomyia.—While the *Stegomyia* is very easily reared under proper conditions of temperature and moisture, it dies rapidly when placed in dry air and without blood as food. In captivity they attain the age of two months with comparative ease, but beginning from the fortieth day, mortality among them becomes large, being greater among the males than among females. In the laboratory females have attained the age of 89, 90, 93, 97, 105, and 106 days. It did not seem possible to preserve males more than 50 days. In the free state the insect can not live so long, much of its vigor being lost within a short time after its evolution, and its resistance is much diminished by danger and destruction of its scales. High temperatures from 36° to 39° are unfavorable to the life of a mosquito.

Racial preferences of the Stegomyia.—The *Stegomyia* will bite individuals of any race, but manifests in Brazil a preference for the white over the Indian, and the Indian over the negro. She manifests considerable repugnance to the negro, and bites only after quite prolonged contact. Among the white races she attacks by preference individuals with a thin skin and a fresh color.

Climatic conditions favorable to the Stegomyia.—Every warm and moist climate whose temperature at certain seasons varies between 25° and 30° is peculiarly suited to it. Between 22° and 25° it multiplies, but more feebly. Average night temperatures below 22° are accompanied by a rapid disappearance of the species. The *Stegomyia* resist sudden changes of temperature badly.

Influence of altitude.—In the vicinity of Rio de Janeiro the *Stegomyia* is seldom encountered at an altitude of more than 400 meters. At Petropolis at an altitude of 800 meters it is not found naturally, and perishes when introduced. It appears, however, that this is not due to the altitude itself, but to the lowered nightly average of temperature.

Relation of other mosquitoes to yellow fever.—The Commission concludes that no other mosquito found at Rio de Janeiro, or in the vicinity, has any relation to the transmission of yellow fever. The Commission draws the following deductions in regard to the transmission of yellow fever as a result of their observations:

First. That yellow fever is not transmitted in nature either by direct contact with the patient or by contact with personal effects, or by his excretions.

Second. That the transmission is effected by the biting of mosquitoes, and that the only dangerous species, at least in the region in which our researches have been conducted, is the *Stegomyia fasciata*.

Third. That this transmission never takes place during the day while the sun is above the horizon.

In regard to protection against the infection of yellow fever, the Commission deduces that "the introduction of merchandise is unattended with danger at any time."

In regard to arrivals from a territory infected with yellow fever, at a port or place where the disease does not prevail, the Commission deduces that "it is perfectly useless to inflict a quarantine if *Stegomyia* do not exist in the country at the time of arrival, since transmission can only be effected by this intermediary."

Measures looking to the destruction of Stegomyia.—The observations of the commission present no points of particular interest for us in the United States. It is gratifying to find, however, that they have

arrived at practically the same conclusions as have been arrived at as the result of experiment and observations in the United States.

The general conclusions of the commission may be summed up as follows:

1. The serum of a patient on the third day of the disease is virulent.
2. On the fourth day of the disease yellow fever blood no longer contains any virus, even when the fever is high.

3. One-tenth of a cubic centimeter of virulent serum injected under the skin is sufficient to cause yellow fever.

4. The virus of yellow fever rubbed upon a blister on the skin, made by removing the epidermis, does not give the disease.

5. In the serum of the patient, the virus of yellow fever passes through a filter Chamberland F without dilution.

6. Under the same conditions, it does not appear to pass through filter B.

7. Virulent serum preserved exposed to the air at a temperature of 24° to 30° is inactive at the end of 48 hours.

8. In defibrinated blood, preserved under liquid vaseline at a temperature of 24° to 30° , the microbe of yellow fever remains living for 5 days.

9. At the end of 8 days defibrinated blood, kept under the same conditions, no longer contains active virus.

10. The virulent serum becomes harmless after heating for 5 minutes at 55° .

11. A preventive injection of serum heated for five minutes at 55° confers a relative immunity which, followed by inoculation with a very small quantity of virus, may become complete.

12. The injection of defibrinated blood kept in the laboratory under liquid vaseline for 8 days at least confers a relative immunity.

13. The serum of a convalescent is endowed with clearly preventive properties.

14. The immunity conferred by the serum of the convalescent is still in evidence at the end of 26 days.

15. The serum of a convalescent appears to have therapeutic properties.

16. As has been proved by Reed, Carroll, and Agramonte, yellow fever is produced by the bite of the *Stegomyia fasciata*.

17. To be able to produce the disease in man, this mosquito must be previously infected by absorbing the blood of a patient stricken with yellow fever during the first 3 days of the disease.

18. The infected mosquito is only dangerous after an interval of 12 days from the time when it has ingested virulent blood.

19. The bite of two infected mosquitoes may cause a serious illness.

20. The mosquito appears to be more dangerous in proportion that her bite is delayed after the time when it has become infected.

21. The bite of infected mosquitoes does not invariably give yellow fever.

22. When the bite of infected mosquitoes has been without effect there is no immunity conferred against the injection of virulent serum.

23. In the neighborhood of Rio de Janeiro, as in Cuba, no other mosquito than the *Stegomyia fasciata* is concerned in the transmission of yellow fever.

24. Contact with a patient, his personal effects, or his excretions, is incapable of producing yellow fever.

25. Outside of the bite of the infected *Stegomyia* the only means known of producing the disease is the injection into the tissues of a susceptible individual of blood from a patient collected in the first three days of the disease.

26. Yellow fever can only assume a contagious character in regions where the *Stegomyia fasciata* prevail.

27. The prophylaxis of yellow fever rests entirely upon measures taken to prevent the *Stegomyia fasciata* from biting the individual sick and then a healthy individual.

28. It must be borne in mind that the period of incubation of yellow fever may be prolonged up to 13 days.

29. The *Stegomyia fasciata* is frequently infected by molds, yeasts, and by sporozoa. No parasite of this species recognized up to this time has any causal relation to yellow fever.

30. Neither in the mosquito nor in the blood have we succeeded up to this time in discovering the causal agent of yellow fever.

[Reports to the Surgeon-General, Public Health and Marine-Hospital Service.]

Summary of work in Chinatown, San Francisco, for the week ended May 21, 1904.

The following is received from Passed Assistant Surgeon Blue, under date of May 23:

Week ended May 21.

Buildings reinspected.....	247
Rooms	2, 113
Persons inspected	2, 758
Sick.....	14
Sick prescribed for at Oriental Dispensary	11
Dead examined	8
Necropsies.....	2
Rats examined bacteriologically.....	23
Number showing pest infection	None.
Places limed and disinfected	910
Times streets swept.....	3
Sewers flushed	18
Notices sent to abate plumbing nuisances	11
Abated	5
Undergoing abatement	10
Total number plumbing inspections	119

Smallpox on S. S. Athenian—Request that consul at Vancouver be instructed to issue bills of health to vessels bound for Alaskan and other United States ports.

WASHINGTON, D. C., May 26, 1904.

OAKLEY, Quarantine, Port Townsend, Wash.:

Consul at Vancouver wires State Department as follows: "Steamship *Athenian* arrived yesterday from Orient. One Chinese sailor died of smallpox while vessel lay at Kobe, Japan. One European passenger having smallpox taken off ship last night and died soon after. Passengers and crew of vessel have scattered about town. Some passengers left for Seattle by train this morning; some left *Athenian* at Victoria and took ship for Seattle and San Francisco." Bureau has